POLYTECHNIC OF CRETE
SCHOOL OF EMMY

LABORATORY OF DISTRIBUTED
INFORMATION SYSTEMS AND APPLICATIONS

DATABASES - PLI 303

FIRST PHASE OF **LABORATORY WORK - SPRING SEMESTER 2021-2022**

TEACHER: Deligiannakis Antonios
LABORATORY **SUPPORT :** Kazasis Fotios, Pappas Nikolaos

I. General description

The implementation of the database of a polytechnic department is requested. The database will contain all the data related to the department and its operation according to the following specifications. For this database you are given the ER diagram, the implementation of a large part of the ER in a PostgreSQL relational database and initial data. The relational database will be given to you in a backup file which you can restore to a PostgreSQL system that you will install on your personal computer. This database contains data on the departments, workshops, courses taught in the department and random registrations for teachers, laboratory staff and students of the department.

As part of the thesis you will need to expand the relational base to meet the need for the diploma and the elaboration / assignment of the thesis as well as to support the creation of student groups for the elaboration of laboratory tasks and exercises, as described below.

Appropriate personal data should be kept for all department members (professors, laboratory staff and students). This data includes: AMKA which is unique for each person, name, surname, father name, e-mail address. Especially for students there should be information about no. registry, date of registration. Teachers belong to grades (full-time, alternate, assistant, lecturer). Also the laboratory staff is distinguished in grades (A, B, C, D). The department is organized research in specific areas (characterized by code, title and description). *Workshops* have also been set up in the department to support the educational process. Each laboratory belongs to a single field, has a unique code, specific title, description and is staffed by teachers and laboratory staff. Each laboratory is led by a teacher who must belong to the highest level and cover one or more cognitive areas which are recorded in the form of three-letter codes (eg PLI, HPY, TEL ...).

All courses are semester. For each course there is a unique code and information is kept related to title, description, teaching units, weekly teaching hours, tutoring support and workshops and have an indicative semester of execution (typical year of study - winter, spring / typical year, typical season). In each semester of the academic year it is decided which courses will be taught. For each semester course, one or more teachers are appointed and in case the course is laboratory, the laboratory in which the work will be prepared and the laboratory staff to support them must be defined in advance.

Each laboratory course requires the preparation of one or more assignments (LabModule) by one or more students. Each laboratory work has a regulation which defines the maximum number of participations in the groups and the participation rate of the grade of the work in the final grade of the laboratory of the course. Students should be able to register either individually or in a group for the preparation of their laboratory work

courses. When evaluating the elaboration of the works, the corresponding grade for each working group is entered in the database.

Course grading rules

For each semester course, the grading rules are defined, from which the final grade of each student is derived. The rules include:

1. The percentage of participation in the written examination in the final grade. If the lesson does not is laboratory, the participation rate is 100%.
2. If the course is laboratory and the student is required to have a laboratory grade above a minimum limit, this limit is recorded otherwise this minimum limit is zero.
3. If the course is laboratory and the student is required to have a minimum degree of written examination, then this limit is recorded. Otherwise, this minimum is zero.

The final laboratory grade of a laboratory course is calculated based on the individual grades of the course work and the percentage of participation of the grade in the final grade of the course laboratory.

The final grade of a course is as follows:

1. If the course is not laboratory, the final grade is equal to the grade of the written exam as the grade is calculated with 100% participation as already mentioned.
2. If the course is laboratory and the laboratory grade is strictly lower than the relevant minimum limit, then zero (0) is automatically set as the final grade point even if the information is requested at a non-zero value.
3. If the course is laboratory and the grade of the written exam is strictly lower than the relevant minimum limit, then the final grade is the grade of the written exam (the grade of the laboratory is not taken into account).
4. In any other case, the percentage of participation in the written examination is applied to combine the laboratory and written grades in the extraction of the final grade.

In order for a student to be considered successful in attending a course and be eligible, he / she must have a final grade higher than or equal to five (5).

The courses are divided into two categories: (a) the compulsory courses, and (b) the optional compulsory courses. The first category includes core courses that provide basic knowledge and must all be successfully completed by a student in order to be able to graduate. The second category includes a large number of specialized courses, from which each student is required to choose and successfully complete a minimum number in order to be able to graduate. Each course may have one or more
prerequisite courses. Also, for each lesson there are no or more recommended courses, which it is desirable (but not mandatory) for the student to know in order to attend it more easily.

In each semester of the academic year, students apply for enrollment (requested status) to attend the semester courses. Requests are generated as proposed by the system. Each application is checked by the system to meet the required conditions and approved (status approved) or rejected (status rejected).

In order to receive a diploma, students are required to prepare a diploma thesis for which a title and grade are recorded. In this context, a committee is appointed by teachers, one of whom is the supervisor at work. The number of members of the committee is determined by the rules of the faculty, which can be updated every academic year. All

Diplomas are registered in the system, have a unique serial number, the final diploma degree and the date of graduation. The diploma grade is calculated from the average of the grades of all the courses required to obtain the diploma with a rate
80% and from the degree of diploma thesis with a weight of 20%. For
calculation of the average of the grades of the courses, the grade of each course
multiplied by the course weight and the sum of the individual
is divided by the sum of the weights of all the courses. The
Weights are calculated according to the teaching units of each course, as shown in the table below:

Credits	1-2	3-4	5
Gravity Factor	1	1.5	2

If a student has successfully completed more courses than the required minimum number of courses for obtaining the diploma, the optional compulsory courses with the lowest success grades are not taken into account for the extraction of the final grade provided, however, that all the conditions for admission are fully met
diploma from the remaining courses.

II. Implementation of the required functionality

Create a database in the PostgreSQL database management system and restore the data from the backup file that will be given to you. Then implement the following functionality:

1. Convert the part of the ER model enclosed in the diagram by the green polygon to a relational shape. Implement the new tables on the database you have already created.
2. Data management (implementation using postgreSQL functions)
   2.1. At the base given to you there is the DiplomaTitles table that contains the titles of the diploma theses that have been prepared in our School. Create a function that will utilize the above table to enter random dissertations for students who are in the 4th year of study or older, have enrolled in at least one course in the current semester and have not been assigned a dissertation.
   2.2. Create a function to introduce student workgroups to do a specific lab work (LabModule). The function will accept as input the working code and the number of groups that will be created. Group members will be randomly selected by the enrolled students of the course maintaining the maximum number of entries set for the assignment.
   2.3. Create a function to enter a grade for enrolled students in specific semester courses which is given as a parameter. A random integer from 1 to 10 will be entered as a written test grade. If there are already grades for some students, they are not updated. For the laboratory grade, the grade of the most recent semester (registered by the student) will be entered if it exists and is greater than or equal to 5. Otherwise, a random integer from 1 to 10 will be entered.
3. Data recovery and calculations (implementation using postgreSQL functions)
   3.1. Retrieval of names and AMKA of teachers and laboratory staff who belong to laboratories of a specific field for which the code is given
   sector.

3.2. Retrieval of the courses together with the grade (the desired grade grade will be given, ie written examination, laboratory grade or final grade) for the current semester and for a specific student (the student's AMKA is given).

3.3. Retrieval of all optional courses (code and title) that are scheduled to be taught in the current semester but are not taught

3.4. Retrieval of the codes of all laboratory exercises of the current semester with the indication YES or NO depending on whether he participates in an implementation team of the exercise a specific student for whom his / her registration number is given.

3.5. Retrieval of the maximum score for each course of a specific semester of the study program. Admission will be given for the semester as well as the desired grade category, ie written examination, laboratory grade or final grade. The results are displayed in descending order of score.

3.6. Finding the field or fields where most graduate diploma theses were prepared. The field of elaboration arises from the laboratory in which the supervising professor is integrated.

3.7. Finding the load of all laboratory staff in the current semester. The workload is calculated as the sum of the laboratory hours for the courses supported by each member of the laboratory staff, increased by one hour per working group participating in the laboratory exercise of the course. The result will be a table in columns: (AMKA, surname, first name, sum of hours). Each set in this table corresponds to a Laboratory Staff Member. The result must show all Laboratory Staff Parts, even if they have zero load.

3.8. **(*)** Find all thesis titles that all committee members working in the same laboratory.

3.9. **(*)** Retrieve all courses that are prerequisites or recommended, directly or indirectly, for a specific course for which the code is given. The result is blocks of the form: (course code, course title).

4. Functionality In the implementation of triggers in postgreSQL

5.1. Automatic control so as not to exceed the maximum number of members in diploma committee and in a working group for a course laboratory.

5.2. If inserted or updated in the Semester panel, you should the generated academic_year traits and academic_season.

5.3. Automatic calculation of the final grade of the course and the new status (pass / fail) of student enrollment in the courses when the necessary individual grades are completed or changed. For this purpose all the scoring rules described above in section I should be taken into account. Entries will not be allowed to enter / update in 'pass' or 'fail' mode as the status will be determined automatically by the scores.

5.4. Automatic check of student enrollment in a semester course to satisfy the prerequisite course restrictions and that their total credits courses that the student will attend along with that course will not exceed 20 credits or the number of courses does not exceed 6. Control is activated when importing new 'requested' records or during update from 'proposed' to 'requested'. If the conditions are met, the situation becomes immediately 'approved', while if the control fails then the status gets the value 'rejected'. It is not allowed to import or update records in / from status 'approved' or 'rejected' because this will only be done through the trigger as already described.

5.5. When entering a new future semester (future status) the introduction of semester courses should be done automatically. A semester course (CourseRun) is created for each course (Course) which has a typical_season equal to the academic_season of that semester. The grading rules (grade_rules), the teaching teachers and (for the laboratory courses) the laboratory staff and the laboratory (Lab) are introduced randomly as long as the subject matter of the course is covered by the laboratory used for the course or the teachers belong to non-laboratory courses.

6. Functionality using views

6.1. **(*)** Presentation of the supervisor and members of the Diplomatic Committee work of students who have not yet graduated. The face will have two fields (AMKA, Commission) where the second field will have the form: <surname1> <name1>, <surname2> <name2>,…, <surnameN> <nameN>. The first name corresponds to the supervisor and the rest to the committee members.

6.2. **(*)** Retrieval of the number of students per year of enrollment for the last 10 years who meet the conditions for graduation and have not yet completed a dissertation. The result will be a table with columns: (year, number). If for a year this number is zero (0) the corresponding set will appear in the result with a value in the column 'number' equal to zero.

III. Deliverable

The deliverable of the first phase of the laboratory work includes the database that you implemented (backup file). Your deliverable **must** be accompanied by a summary report stating the names of the stored functions that implement each job request.

All functions marked with (*) will be delivered with the 2nd phase of the laboratory work.

Phase A participates at a rate of 70% in the final degree of laboratory. The remaining 30% concerns the second phase of the work.

Delivery date: May 9, 2022

Good luck!

IV. Install PostgreSQL and pgAdmin graphical interface

To install the PostgreSQL Database Management System and the pgAdmin graphical interface that you will use in the lab, you can download the relevant installation file from https://www.enterprisedb.com/downloads/postgres postgresql-downloads **Select version 13.6.** The installation file contains both the PostgreSQL server and the pgAdmin graphical interface. Once downloaded to your computer run it and follow the instructions. Remember the password you will give during the installation, as you will be logged in to the server by pgAdmin.

More information on the operation of the graphical environment and the server will be given in the laboratories and tutoring of the course so that there is all the necessary support during the preparation of the laboratory work.

V. Installation of the laboratory database work

The utterance is accompanied by a backup of the database that you will use in the laboratory work. To restore this copy to the server that you will install on your computer, you must first log in via pgAdmin by setting 'hosth / address' localhost' and giving the password that you set during installation. Once logged in you will create a new database by right-clicking on the 'Databases' item below the node in the Servers hierarchy corresponding to your local server and selecting' Create ÿ 'Database'. Give the base a name of your choice and then right-click on the node that will be created with the name you gave and select 'Restore…'. In the dialog that will appear, select the file that corresponds to the copy of the database you were given (Filename field and select the file by pressing the '…' button). Finally press the 'Restore' button and the database with all the tables, functions, formulas, etc. is created. containing.

VI. Conceptual shape of the database

The following is a diagram of the correlation entities for the database that you will use in the lab work. In addition to the tables that implement the types of entities and types of correlations of this diagram, the database also contains the tables Name, Surname with names and adjectives in the Greek language that you can use to create new records for teachers, students and laboratory staff. It also contains the DiplomaTitles table which contains the titles of the diploma theses that have been prepared in our School that you will use for the introduction of random diploma theses.